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ABSTRACT

The Bridges SOI Model School Program is an educational service based upon the SOI (Structure of Intellect) Model School curriculum. For the middle seven months of the academic year, all students in the program complete brief daily exercises that develop specific cognitive skills delineated in the SOI model. Additionally, intensive individual activities are undertaken by a subset of students judged by school staff to be at-risk academically. This study evaluated the first year of this program as implemented at a 154-student K-8 school in Palo Verde, Arizona. Student performance was measured before and after program implementation, using the Stanford Achievement Test Series, the Cognitive Abilities Test, and the SOI Analysis Profile of Cognitive Abilities. Further, brief structured interviews were used to elicit and record perceptions of staff. Findings indicated that after one year, the principal, Lab Specialist and aide, and teachers of this school expressed a markedly positive view of the Bridges program. Further, clear gains were made by Bridges Lab participants on most of the SOI indices. Beyond Bridges program-specific measures, for two grade levels, there was evidence of reliable improvements in Stanford Achievement Test mathematics scores. However, there were no discernible effects of the program on Stanford Achievement Test reading scores or on Cognitive Abilities Test verbal, quantitative, and nonverbal scores. In contrast, there was also evidence of a reliable decline in mathematics performance at one grade level. (Five appendices include raw and statistical analysis data.) (JS)

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The Bridges SOI Model School Program

At Palo Verde School

Palo Verde, Arizona 85343

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October 23, 1998

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This document reviews information that pertains to the first academic year (1997-98) of implementation of the Bridges SOI Model School Program (hereafter the Bridges program) in Palo Verde School, Palo Verde, Arizona. The report was completed by Statistical Consulting Services of Tempe, Arizona. Intellectual Development Systems, Inc. (hereafter IDS), of, Annapolis, Maryland, commissioned this report. The report contains sections describing the Bridges program, the community and school, the tests and measures, and general findings. A final section contains a summary, impressions, and recommendations. Five appendices contain supporting documents.

The Bridges Program

The Bridges program[1] is an educational service based upon the SOI (Structure of Intellect) Model School curriculum[2]. IDS distributes all program materials and delivers training and support services to a participating school. Following Dr. J. P. Guilford's model of human intelligence,[3] as applied to education by Dr. Mary Meeker,[4] the SOI Model School curriculum has both group and individual elements. For the middle seven months of the academic year in each classroom, all students complete brief daily exercises (15 or 20 minutes each) that develop specific cognitive skills specified in the SOI model. These exercises prepare the cognitive abilities which schools assume each student brings to the classroom; e.g., attention span, memory and recall, comparison/contrast thinking, process orientation, symbol decoding, contextual comprehension, etc. More advanced SOI activities are interspersed among these classroom SOI exercises, to enhance the student's abilities in such higher-level domains as creativity, algorithmic logic, systems analysis, cause/effect reasoning, judgment, etc. For 1997-98, these exercises were in the form of loose-leaf worksheets; for 1998-99, they are bound in consumable workbooks.

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[1] *SOI Model School Program Standard Program Description.* Intellectual Development Systems, 1998. The program is also implemented in secondary schools, corrections, and welfare-to-work settings, where its components differ in certain particulars.
[2] *The SOI Model School.* Robert Meeker and Mary Meeker, 1995.
[3] *The Nature of Human Intelligence.* J. P. Guilford. McGraw-Hill, 1967.

Additionally, intensive individual activities are undertaken by a subset of students judged by school staff to be at-risk academically. Per the school's contract with IDS, a given percent of a student body (usually 20 or 25 percent) may be referred and served by the individually based "Learning Development" component of the Bridges program; at Palo Verde, the IDS contract calls for a referral of up to 20 percent of the student body. These activities are prescribed in an individualized Learning Development intervention plan, according to the Integrated Practice Protocol ("IPP") methodology created by Dr. Mary Meeker and Dr. Robert Meeker.[5] In brief, this subset of students is referred to a classroom in the school that is equipped and supplied to remediate cognition, sensory integration and visual processing. For 1997-98, this classroom was called the "IPP Lab"; for 1998-99, it is the "Bridges Lab." Depending upon the number of students served, a school's Bridges Lab is staffed by a teacher designated as the "Bridges Specialist," and one or more paraprofessional aides; at Palo Verde, the Lab is staffed by one Specialist and one part-time aide.

In the Bridges Lab, referred students receive prescriptive "Learning Development" intervention, for cognition, sensory integration and visual processing difficulties. Students in Grades 2 and under directly receive age-appropriate early intervention, while students in Grades 3 and up are administered assessments in these three domains by the Bridges Specialist. As indicated by assessment results, an individualized intervention of cognitive/perceptual exercises is planned for these students, to complete in the Bridges Lab. Students with a Learning Development intervention plan spend one period twice a week in the Bridges Lab systematically working through exercises and activities prescribed for him or her. According to descriptions of the Bridges program, completion of these Learning Development activities typically requires five to nine months.

As described, the Bridges program requires a substantial commitment of school resources. A room must be dedicated to the Bridges Lab and staffed by one full-time Specialist

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[4] *The Structure of Intellect: Its Uses and Interpretation.* Mary Meeker. Charles Merrill, 1969.
[5] *IPP: A Treatment Plan for Dysfunctional Students.* Mary Meeker and Robert Meeker. SOI Systems, 1992.

and one part-time aide. Classroom teachers participate by insuring that students complete the basic daily development (workbook) materials, as well as the intermittent advanced materials. IDS stipulates that faculty support for the program should be 100 percent, and requires formal communication of this support by the participating school.

The Community and School

Palo Verde is an unincorporated community about 45 miles southwest of Phoenix, Arizona. The location of Palo Verde is indicated by a small arrow in the center of the map on the following page. The community is rural and agricultural, with a 1990 census population of less than 700 persons. Palo Verde School offers instruction for classes from kindergarten through the eighth grade, and graduates typically enter Buckeye High School in Buckeye, Arizona.

Enrollment at Palo Verde School averages about 175 students. About equal numbers of students are Anglo (45 percent) or Hispanic (45 percent), with Blacks comprising the remaining major category (10 percent). Eight percent of students are classified in special education categories. Twenty-five percent of students have limited English proficiency, and 65 percent qualify for the free or reduced lunch program. Class size varies from 22 to 30 students. The school is modern. Based on a half-day visit by staff of Statistical Consulting Services, the school appears well kept and reasonably equipped.

At Palo Verde, 75 students were referred to the Bridges Lab for Learning Development intervention. This level of referral to the Lab is at a rate about twice that specified by the school's contract with IDS. In discussing referrals to the Lab, the principal of Palo Verde indicated her support for the program and described her efforts to have as many students as possible benefit from participation. A more detailed summary of principal, Specialist, and teacher reactions to the program appears in the Findings section.

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Tests and Measures

This section provides brief overviews of tests and measures examined in the process of reviewing the Bridges program at Palo Verde School. First, there were measures of the performance of students. These measures included: (a) reading and mathematics total scores of the Stanford Achievement Test, 9th edition (all students); (b) verbal, quantitative, and nonverbal scores of the Cognitive Abilities Test (gifted and other high ability students); and (c) the measures of the SOI Form CR and Form L assessments (Bridges Lab participants). Second, there were perceptions of staff. Included here were responses to a brief structured interview by the principal, Bridges Specialists, and a sample of five teachers.

The Stanford Achievement Test Series, ninth edition, (hereafter, Stanford 9)

The Stanford 9 is a nationally recognized set of standardized school achievement tests in subjects such as reading, mathematics, science, language and the social sciences. The eight test levels[6] that comprise the Stanford 9 examine attainment of curriculum milestones set for grades one through eight. The Spring Norms Book of the Stanford 9 describes test development and national research conducted on the use of the Stanford 9 forms[7].

Several types of scores can be obtained from the Stanford 9, including raw scores, scaled scores, and percentile ranks. Raw scores are simply an indication of the number of correct answers a student has obtained. Raw scores do not reflect the length, difficulty or level of the subset of questions answered and, therefore, are only used to derive scores which take this into account. Scaled scores provide such a measure, offering a single scale across all forms and levels of test in a single domain (e.g., mathematics). However, scaled scores cannot be compared across different subject matter. Each subject matter has an independently derived scale score basis. Percentile ranks are a type of norm-referenced score. They describe the performance of an individual student with respect to other students in the same grade who took

[6] Primary 1, 2, and 3, Intermediate 1, 2, and 3, and Advanced 1 and 2.
[7] Stanford Achievement Test Series Ninth Edition, Spring Norms Book. Harcourt Brace & Company, 1997.

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the test at a comparable time. They are used for comparison purposes, as they do not indicate absolute amounts of ability. As an example, a percentile rank of 60 would mean that 60 percent of the reference group obtained scaled scores equal to or less than the scaled score achieved by that individual. In this report, scaled scores are used as the primary index of performance.

All students (grades 2-8) at Palo Verde School take the Stanford 9 battery in the spring of each academic year. Thus, test scores from the Spring of 1997 may be used to assess student achievement before initiation of the Bridges program, while test scores from the Spring 1998 may be used to assess student achievement near the end of the first academic year of implementation of the Bridges program. In the section on findings, we examine changes in test performance over this period.

The Cognitive Abilities Test[8] (hereafter, CogAT)

The CogAT is a nationally standardized battery that assesses reasoning ability by means of measures of verbal, quantitative, and nonverbal (spatial) reasoning skill. Different forms of the CogAT insure coverage from Kindergarten to grade twelve. Items on the CogAT were constructed so vocabulary level and sentence structure do not unduly influence test performance. The tests are designed so teachers may begin testing individual students at different levels of difficulty, and adjust testing based upon initial responses (either to proceed to less or more difficult items). In the multi-level battery used for higher grades, assessment of verbal ability focuses on sentence completion, verbal classification, and verbal analogies. Assessment of quantitative abilities stresses quantitative relations (e.g., relative size), number series, and equation building. Assessment of nonverbal abilities employs the classification and analysis of figures, as well as figure analogies. There is good evidence for the internal consistency reliability of the CogAT. Raw and scaled scores are obtained from the CogAT -- the latter including a cross-form universal scale score and a grade equivalent scale score.

[8] Cognitive Abilities Test. Riverside Publishing, A Houghton Mifflin Company, 1993.

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At Palo Verde School, students who participated in a program for gifted students were administered the CogAT, as well as a number of other high ability students. They were tested twice -- for most students these test occasions were in the spring of 1997 and 1998. We examine changes in these test scores in the section on findings.

The *SOI Analysis*[9] Profile of Cognitive Abilities (hereafter, the SOI measures)

The SOI measures assess the strengths and weaknesses of a student's cognition, sensory integration and visual processing. In Grade 3, cognition is assessed with the *SOI Assessment,* Form CR[10] or Form L,[11] depending upon the referred student's observed maturity/developmental level; in Grades 4 and up, Form CR is used for all referred students. For all referred students in Grades 3 and up, sensory integration and visual processing are assessed with the *Sensori-Integration Assessment* and the *Perceptual-Cognitive Assessments.*[12] For Grades 2 and under, referred students directly receive age-appropriate early intervention.

SOI Analysis is a computer program used in the Bridges Lab to monitor each individual student's progress on his or her Learning Development intervention plan. Once a student has completed the initial assessment battery, the computer program prescribes the intervention plan for the student. As a student progresses through his or her plan, these accomplishments are recorded and tracked within the program. Among other reporting and analysis functions, the program can generate a specific report that documents student progress on the various SOI measures of cognitive skills (Stanine and raw scores were available; raw scores were analyzed for this report). Form CR comprises 27 measures; Form L, 11 measures.

The SOI measures are clustered in five categories, including Cognition (comprehension), Memory (retrieval from storage), Evaluation (judgment, planning, reasoning, and critical decision making), Convergent Production (solving problems where answers are known), and Divergent

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[9] SOI Systems Software. Mary Meeker, 1980, 1991.
[10] *SOI Assessment,* Form CR. Mary Meeker. SOI Systems, 1991.
[11] *SOI Assessment,* Form L. Mary Meeker and Robert Meeker. SOI Systems, 1993.
[12] *Sensori-Integration Assessment* and *Perceptual-Cognitive Assessments.* Mary Meeker and Robert Meeker. SOI Systems, 1993.

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Production (solving problems creatively). The SOI measures form the core assessment tool of the SOI computer system.

Unlike the Stanford 9 and CogAT testing, which occurred either on fixed occasions or in a constrained period of time, assessment of the SOI measures depended on the dates of referral to the Bridges Lab. Thus, across students there is some variation in the period from initial and final testing.

Brief Structured Interviews

Appendix A contains two forms that were used to elicit and record the perceptions of staff. Form 1 was distributed to the Principal. Page 2 of Form 1 was also distributed to faculty. These distributions occurred prior to our initial site visit to Palo Verde School, and completed forms were collected during the site visit.

Page 1 of Form 1 focuses on the composition of the school and community. The items of page 2 of Form 1 form were intended to assess staff perceptions about changes in their own degree of buy-in to the program, as well as general impressions regarding the specification and implementation of the Bridges program. Form 2 was used during the site visit to elicit these same reactions from teachers available for a brief interview. Responses to the items of these forms appear at the end of the following section.

Findings

This section is organized into subsections, including: (a) one about the general character of the participants, (b) four about results from the Stanford 9 Reading and Mathematics scores, (c) one devoted to the SOI measures, (d) one on the CogAT, and (e) one on the structured interviews. Accompanying this report is a diskette that contains several supplementary files. There is a file containing the present document in Word 97 format (PALO VERDE REPORT.DOC). An additional file contains an SPSS data file (MERGE.SAV from SPSS version 7.5), and a final file is a comprehensive listing of the statistical analyses that underlie the findings reported here. The latter file (FINDINGS.DOC) is in Word 97 format.

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There were 154 students continually enrolled in the Palo Verde Elementary School grades three through eight from spring of 1997 to spring of 1998. In those classes, there were 72 girls and 82 boys. Just less than half of all of these students (49%) participated regularly in the Bridges Lab. Although a higher percentage of boys (54%) than girls (43%) attended the Lab, this was not found to be a meaningful difference. It is worth repeating here that the description of the standard SOI Model School program specifies that "students who are particularly challenged" be selected for participation in the Bridges Lab. Based on analyses of Stanford 9 results from spring of 1997, the selection of children into the Palo Verde Bridges Lab differed from this specification, and the educational ability of children in the Lab varied somewhat by grade (See Appendix B).

Of the 75 children for whom Learning Development intervention plans were designed in the Bridges Lab in October of 1997, most had not completed their intervention plan by our site visit in September of 1998. Sixty percent of students had completed 20% or less of their plan, while only 4 students had completed 50% or more of their plan. No student had finished his or her plan. (Appendix C contains a table that presents the composition of Lab participants by educational status).

Only those students who had standardized test results for both before and after the initiation of the Bridges program can be used in analyses and comparisons of improvement over initial year of implementation. Table 1 shows the number of children in Palo Verde School by grade, as well as the number of students in each grade who participated in the Bridges Lab. Finally, also shown are the numbers of children for whom we have both pre-program and post-program results for each of the measures described earlier (the Stanford 9 Reading and Mathematics total scores, the CogAT verbal, quantitative, and nonverbal scores, and the SOI measures). A review of Table 1 reveals that some of these sample sizes are very small and preclude meaningful analysis by grade; however, for the sake of interest, results for all three sets of measures are described in the following sections of this report.

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Table 1. Pre- and Post-Program Score Availability:
All Measures Classified by Grade

Grade	Classification of the Number of Students					
	Total	Bridges Lab Participation	Stanford 9 Total Score		SOI Measures	CogAT
			Mathematics	Reading		
3	24	7	16	15	7	1
4	22	12	17	17	12	2
5	25	10	16	15	10	7
6	31	25	22	17	22	4
7	27	13	19	19	13	5
8	25	8	18	18	7	1
Total	154	75	108	101	71	20

Note. Six of the seven third grade students took SOI Form L, so have measures on only 11 SOI cognitive abilities.

Stanford 9 Achievement Tests: Total Reading Scores

Below, Table 2 contains descriptive statistics for the Stanford 9 total reading scaled scores for all children in grades three through eight, classified by Lab participation. On average, students who attended the Bridges Lab increased their overall reading score by about 19 points. In contrast, students who did not go to the Lab increased their reading scores by about 21 points. Although the gain in scores is slightly higher for students who did not participate in the Lab, the two mean gain scores do not reliably differ. Further, subsequent analyses comparing students within each grade did not produce any reliable differences in gains between students participating and not participating in activities in the Bridges Lab.

Table 2. Pre- and Post-Program Stanford 9 Reading Means:
Classified by Bridges Lab Participation

Participation	Mean: Stanford 9 Reading		Mean Difference
	Initial Test	Final Test	
Non-Lab students	625.17	645.87	20.73
Lab students	639.16	658.28	19.12

Differences by gender were also explored. Overall, boys and girls exhibited similar gains in reading scores. Among Lab students and among non-Lab students there were no reliable

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differences between the sexes. Among boys only, Lab participation was not found to have a significant influence on the mean gain score. Similarly, among girls only, mean gain score did not vary reliably by Lab participation.

Table 3 depicts a summary of Stanford reading scores for students not classified as either special education or gifted students -- i.e., for just those students who most closely fit the profile of students for whom the Bridges program was designed. The analyses conducted on the scores of these students revealed improvement in Stanford reading scores: (a) from initial to final testing, and (b) from lower to higher grades. Within individual grades, there were no reliable effects on Stanford reading scores that could be attributed to participation in the Bridges program.

Table 3. Students not Identified as Either Special Education or Gifted: A Summary of Stanford Total Reading Scores on the Initial and Final Test Occasions

Grade	Bridges Lab Participation	Initial Test		Final Test		N	Number with positive gain
		Mean	SD	Mean	SD		
3	No	570.82	46.56	588.45	48.83	11	9
	Yes	532.00	2.83	555.50	34.65	2	2
4	No	577.00	21.50	615.83	42.43	6	5
	Yes	570.4	35.70	606.33	26.93	9	9
5	No	617.00	18.68	639.50	18.89	6	5
	Yes	612.00	44.40	641.00	38.69	3	3
6	No	701		701		1	0
	Yes	640.87	27.96	655.87	37.59	15	13
7	No	645.63	35.12	663.88	28.85	8	7
	Yes	675.00	38.66	702.33	31.91	6	5
8	No	683.08	25.55	700.08	29.81	12	11
	Yes	689.40	52.98	696.60	38.03	5	2

Note. SD signifies standard deviation. A blank indicates too few scores to compute the statistic.

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Stanford 9 Achievement Tests: Total Mathematics Scores

Table 4 depicts means for Stanford 9 mathematics scores for all children in grades three through eight, classified by Lab participation. On average, students who attended the Bridges Lab increased their overall math score by just over 21 points. Students who did not go to the Lab increased by just over 19 points. Although the mean gain score over the two testing periods is slightly higher for students who participated in the Lab, this was not found to be a reliable difference. As with reading score gains, there were no significant differences by gender.

Table 4. Pre- and Post-Program Stanford 9 Mathematics Means: Classified by Bridges Lab Participation

Participation	Mean: Stanford 9 Mathematics		Mean Difference
	Initial Test	Final Test	
Non-Lab students	621.17	640.48	19.30
Lab students	632.10	653.31	21.21

Analysis by grade revealed a few points worth mentioning here. Students in grade four who did not participate in the Bridges Lab had a mean score gain of 28.83 points, while Lab students showed a mean gain of 45.36 over the same period. Although this difference was not significant at a usual level of statistical confidence (5%), it was within the 10% confidence level. This may imply that students in grade four who participated in the Lab made significant gains in their math scores, relative to classmates who did not attend the Bridges Lab. It should be noted that fourth grade students who went to the Lab had somewhat lower initial scores than fourth grade students who did not. This suggests that a possible effect of Bridges Lab attendance was to bring these students up to par with the other students in grade four. It is not clear from the available data why this kind of gain was not observed in other grades where the pre-program test scores for Lab students were lower on average than for non-Lab students.

The opposite effect can be seen for students in grade five. The Bridges Lab students in grade 5 are primarily labeled as gifted (60%). The fifth grade Lab students, as a whole, had significantly higher initial math scores than classmates not participating in the Lab. The mean

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gain of these Lab participants on the Stanford 9 total math scores was only 5.22 points, compared with an average 20.43 point gain among corresponding non participants. This was a reliable difference in average gain. In other words, fifth-grade Lab students did not gain as much on their math scores over the one-year period as the non-Lab students did. This could be due to a number of factors that can only be speculated on here. For example, the already high scores of gifted students may not normally increase as much each year as the scores of other children. It is also possible that there is some regression of scores to the mean -- as the initial high scores of some children may be due to lucky choices that did not occur on the final test. Alternately, Lab participation may have had a negative effect on fifth-grade mathematics achievement. To further understand this finding, the assignment of students, particularly gifted ones, to Bridges Lab participation should adhere more closely to principles of sound study design, and especially attend to a need for random, or clearly unbiased and equal, assignment to treatment conditions. (Appendices D and E summarize the various analyses of Stanford 9 reading and mathematics scores conducted by grade level).

Table 5 examines Stanford mathematics scores for just those students who most closely fit the profile of students for whom the Bridges program was designed. The analyses conducted on the scores of these students revealed improvement in Stanford mathematics scores: (a) from initial to final testing, and (b) from lower to higher grades. Within individual grades, there were three reliable effects that could be attributed to participation in the Bridges program. First, fourth-grade students participating in the Bridges Lab had lower initial mathematics scores but higher final scores than their counterparts ($p \leq .06$). Second, seventh-grade lab participants started and ended the year with reliably higher mathematics scores than their counterparts. Third, eighth-grade lab participants started and ended the year with higher mathematics scores, but their rate of gain was reliably lower than the rate of gain of their counterparts.

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Table 5. Students not Identified as Either Special Education or Gifted: A Summary of Stanford Total Mathematics Scores on the Initial and Final Test Occasions

Grade	Lab	Initial Test		Final Test		N	Number with positive gain
		Mean	SD	Mean	SD		
3	No	560.45	36.93	579.27	36.98	11	9
	Yes	535.50	26.16	554.50	54.45	2	1
4	No	573.50	23.61	602.33	29.69	6	5
	Yes	558.67	29.36	605.33	34.72	9	9
5	No	610.33	23.02	630.17	20.06	6	6
	Yes	625.67	22.55	638.33	31.39	3	2
6	No	663.00		702		1	1
	Yes	633.00	25.19	661.93	30.55	15	13
7	No	647.63	18.84	674.50	22.21	8	6
	Yes	687.17	35.74	706.00	343.22	6	6
8	No	687.83	29.05	696.83	28.40	12	9
	Yes	716.60	62.20	712.80	58.41	5	3

Note. SD signifies standard deviation. A blank indicates too few scores to compute the statistic

Stanford 9 Scaled Score Gains and Completion of Intervention Plans

Although none of the Lab students completed their Learning Development intervention plan within a year, it is possible to examine reading and mathematics scaled score gains by the percent of the plan a child had completed. It should be noted that the percent plan completed was calculated for the period October 1997 (when the program was started) to September 1998 (the time of the site visit), while test score gains refer to the period March 1997 – March 1998. There was a reliable, negative relation between the percent plan completed and the scaled score gains for reading (correlation coefficient = -0.28, $p \leq 0.04$). In addition, there was a negative, although not significant, relation between mathematics scaled score gains and percent plan completed (correlation coefficient = -0.22, $p \leq 0.1$). In other words, the more activities/exercises a child had completed on his or her intervention plan, the smaller the scaled score gain achieved on the Stanford tests. Further data need to be collected to understand the meaning of this finding. Ability and other attributes of students, the composition of plans

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prescribed, and the time it takes to complete different elements of plans are all factors that have to be considered.

Stanford 9 Achievement Tests: Expected Gains Derived from the Stanford Spring Norms

Table 6 is a summary of scale scores to be expected at each grade, for persons at the 50th percentile in the Stanford Spring Norms book. The Table contains values for both reading and mathematics total scores. In order to compare the performance gains of students at Palo Verde with typical gains achieved by children as they progress through grade levels, their scores were compared to these average (50th percentile) scaled scores. The average expected gains over the academic year are calculated as the scaled score achieved at each grade level minus the score for the previous grade level. For example, the average expected scaled score gain in total reading for a sixth grader in the Spring of 1998 would be 9 scaled score points (663-654=9). Each students scaled score gain would then be compared to this average to determine if their test results had improved more or less than might be expected. Table 7 summarizes the relation of reading and mathematics gains made by students of Palo Verde School, relative to the expected gains derived from Table 6.

Table 6. Stanford 9 50th Percentile Scaled Scores:
Students Tested During the Spring

Grade	Total Reading	Total Mathematics
2	581	573
3	616	599
4	638	625
5	654	646
6	663	656
7	681	670
8	691	679

Table 7. Observed Minus Expected Scaled Score Gains:
Classified by Grade, Measure and Bridges Lab Participation

Grade	Mean Observed Minus Expected Student Scale Score Gain			
	Reading		Mathematics	
	Lab Non Participants	Lab Participants	Lab Non Participants	Lab Participants
3	-17.36	- 7.50	- 7.18	-12.20
4	16.83	11.09	2.83	19.36*
5	6.50	- 3.78	- 0.57	- 15.78*
6		6.13	11.00	15.85*
7	0.25	1.55	12.88	1.36
8	7.00	- 1.83	0.00	- 6.67
Total	0.59	2.84	1.28	4.87

Note: An * indicates significantly different from 0. A blank cell indicates numbers too small to calculate means.

A review of Table 7 indicates that most of the gains were not reliably different from what would be expected over the course of a school year (i.e., zero difference from the standard). There are three exceptions. Mathematics gains among the Bridges Lab students are greater than would be expected for grades four and six, while mathematics gains among fifth grade Bridges Lab students are less than would be expected. Recall here that the fifth grade Lab students were predominately gifted, which possibly limits the gains that might be observed for them (See the previous section on mathematics scores for other discussion).

The SOI measures

Table 8 depicts gains in SOI measures across testing periods, classified by grade. The gains for most measures for Lab students as a whole were positive and reliably different from 0. In other words, it was not by chance that there was improvement from pre-program testing to post-program testing. This analysis does not use scaled scores or examine expected gains.

Table 8 Gains in SOI Scores: Classified by Grade and Measure

The SOI Measures	GRADE						
	3	4	5	6	7	8	3-8
CFU	4.14*	2.33*	0.90	2.59*	2.23*	3.14*	2.45*
CFC	1.14	0.00	0.40	0.00	0.00	1.14	0.28
CFS		5.33*	3.60	4.23*	2.46	1.57	3.74*
CFT		3.08*	2.70*	2.50*	3.85*	3.57	2.95*
CSR		0.08	1.30	1.00*	-0.38	1.00	0.63*
CSS	2.00	1.17*	0.30	0.14	-0.23	-0.29	0.41*
CMUr	2.00*	0.83	0.40	2.86*	1.00	0.00	1.46*
CMUm		1.42	2.00	3.00*	1.77	1.00	2.12*
CMR	-1.71	2.33*	1.20	0.50	1.08	3.14	1.06*
CMS	0.86	2.58*	3.00*	2.23*	0.92	1.43	1.94*
MFU	3.57	2.00	3.80*	1.91	2.23	5.43*	2.76*
MSUv		2.25	0.60	1.77*	0.15	0.29	1.18*
MSSv		4.58*	0.10	1.32	1.77	4.00	2.25*
MSUa	2.00	0.58	-0.60	2.36*	2.85*	-0.86	1.38*
MSSa		0.33	3.10	1.00	5.15*	-1.00	1.85*
MMI		2.00	0.30	2.41*	2.23	2.14	1.91*
EFU	2.00	-0.50	1.90	0.05	1.77*	0.00	0.62
EFC		-0.58	-0.50	-0.41	0.69	0.86	-0.08
ESC		1.33	4.70*	2.41*	2.38	2.43*	2.62*
ESS		0.58	1.30*	0.82	-0.15	0.00	0.55*
NFU		4.25*	5.40*	5.18*	6.85*	5.29*	5.37*
NSS		1.25*	1.00*	0.86*	1.08	0.43	0.92*
NST	13.50	13.50*	10.30	15.91*	15.46*	10.00	13.83*
NSI		5.00*	0.40	2.09*	1.62	2.00	2.37*
DFU		-0.42	5.20	0.09	8.77*	0.29	2.85*
DMU		17.92	-1.80	-0.27	1.85	3.29	4.02
DSR		-3.50	2.40	17.82*	17.85	4.00	10.10*

Note: An * indicates a gain is reliably different from 0. Blank cells have too few students to calculate means.

The small number of Bridges Lab students in each grade makes it difficult to interpret the findings by grade. The most consistent gains across grades were in the convergent-production abilities (N category). This may reflect a focus of program instruction unique to this site, or some other factor. Across students, all of the reliable differences are in a positive direction. The

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supplementary output files contain a more detailed summary of the grade-by-grade statistical analyses.

The Cognitive Abilities Tests

The CogAT verbal, quantitative, and nonverbal measures were administered to students at Palo Verde who were considered high achievers. All 20 of these students also participated in Bridges Lab activities. The small numbers preclude any analysis by grade but overall changes over the study period are summarized in Table 9 below.

Table 9. Pre- and Post-Program CogAT Means:
Classified by Test

Participation	Mean: Stanford 9 Mathematics		Mean Difference
	Initial Test	Final Test	
Verbal	56.15	57.95	1.80
Quantitative	44.90	47.65	2.75
Nonverbal	48.95	48.60	-0.35

None of these differences were found to be reliable and there were no groups of student with which these scores could be compared. Looking at the individual score improvement, there was considerable variation. In the verbal battery, the range of change was –5 to 23 points, with 50% of students showing no or negative progress. In the quantitative battery, the range was similar, –8 to 22 points and 30% of students recorded change of less than 0. Finally, the range of score improvement was –13 to 12 in the non-verbal battery and 45% of students received score changes of 0 or less. A larger sample of student performance on the CogAT is required, if this scale is to be used to assess performance changes attributable to the Bridges program.

Brief Structured Interviews

Brief structured interviews were conducted with the principal, the Bridges Lab aide, and four teachers. The responses from the Bridges Specialist and one teacher were obtained in questionnaire format. All of these responses are summarized below.

Did Faculty Buy-in Change Since Program Initiation. The principal indicated that she chose to have the school participate in the program. She judged that faculty support for the program had increased over the course of the first year. The Specialist and the aide, and two of five teachers, shared this view. The remaining three teachers indicated that their degree of support was about the same.

Was Implementation Consistent with Specifications for Implementation. The principal, the Specialist and the aide, and all teachers affirmed that the implementation was consistent with descriptions and specifications provided before the program began. The principal expressed a concern about the cost per student issue. Part of this concern was a consequence of her enthusiasm for the program. Simply stated, she would have preferred to see even more students participate, but was constrained by the costs of additional materials. One teacher thought that the participation of teachers should be more clearly spelled out, in that teacher efforts for the program were viewed as somewhat greater than originally described.

Did Student Participation Match Specifications for their Participation. The principal unequivocally endorsed this idea, and was particularly pleased with the clear Learning Development intervention plan generated for each individual student participating in the Bridges Lab. The Specialist, the aide, and four of five teachers shared this view. One teacher did not. Two concerns emerged in responses to this question. First, there was a concern about the lack of follow-up to the daily in-classroom Bridges workbooks. Second, there was a concern that the gifted students did not like the program. This latter concern was expressed by more than one person.

Did Corporate Participation Match Specifications. The principal, the Specialist and the aide, and all teachers affirmed this proposition. Beyond the general affirmation, some specific issues were raised for corporate consideration. First, there was a concern about the quality of trainers selected for the second phase of training. Those selected were judged to be less capable than they could have been. Second, it was suggested that more be done to insure teacher buy-in early in the program. Third, the program creates scheduling problems. The

principal judged this problem to be particularly acute in small schools. In contrast, there was general support for the clarity of the plans generated for students.

Summary

The principal, Lab Specialist and aide, and teachers of Palo Verde School express a markedly positive view of the Bridges program. Their informal impressions are very consistent. In addition to behavioral changes they may be observing in students during daily activity, there are clear gains being made by Bridges Lab participants on most of the SOI indices. Beyond Bridges program-specific measures, for two grade levels, there was evidence of reliable improvements in Stanford 9 mathematics scores. However, there are no discernible effects of the program on Stanford 9 reading scores or CogAT verbal, quantitative, and nonverbal scores (gifted and other high ability students only). In contrast, there was also evidence of a reliable decline in mathematics performance at one grade level. Note that all objective test information must be considered in light of the fact that the program has only been in place one year. A clearer view of program impact would emerge over a more extended period.

In future documents, it is specifically recommended that IDS consider expanding the range of performance measures to include such items as classroom grades and teacher ratings of behavior. The authors were particularly struck by the enthusiasm of the Palo Verde faculty for the program. It is possible that indices of academic performance that are more closely connected to daily school activities will reflect changes in student behavior (due to the program) better than nationally standardized indices.

Implementation of the Bridges program differed from IDS specifications in ways that may mask an accurate picture of program effects. First, the referral rate to the Bridges Lab substantially exceeds the 20 percent rate contracted with IDS. Second, substantial numbers of gifted students (and other students not at-risk academically) were referred for Lab activities. Although the justification for these changes is understandable (more capable students should also be able to benefit from the program), the mixing of participants with markedly different attributes precludes clear conclusions being drawn about the program's effect. Finally, the rate

of completion of Learning Development intervention plans is not commensurate with what program literature describes as typical. It is possible that this latter finding is directly linked to the fact that the referral rate to the Bridges Lab is more than double the specified rate.

If program services are extended to students who are not at-risk, then findings that are attributed to gifted students in this report should be considered seriously. There were no discernible positive effects on the gifted students. Further, given that one teacher independently voiced (and two others provided affirmation) the opinion that the gifted students did not like the program very much, there is a need to systematically examine the program's effects on students who are not at-risk. To examine the program's effects on students who are not at-risk would require substantial changes in referral decisions (including identification of appropriate comparison groups), and these changes would create new complications of implementation. Of particular note is the issue of whether or not gifted and at-risk students ought to participate in Lab activities at the same time. Clearly, a number of empirical issues are involved in the extension of services beyond the currently identified population.

An ancillary concern raised by increasing the referral rate is the matter of the number of students attending the Lab at any given time. For a given setting with a set of resources designed to meet the needs of up to 20 percent of the student population, increasing the referral rate will increase the demand on these resources, and may subsequently diminish positive aspects of program impact. Whether or not this matter explains the present set of findings can not be decided on the basis of the evidence and information available.

For the purposes of examining SOI scores in a normative sense, there is a need to test students who do not engage in Lab activities. This issue extends beyond the setting examined in this report. Rather the matter goes to normal development and maturation: what types of gains on the SOI measures would one observe in ordinary children who do not participate in Lab activities?

Appendix A

Structured Interview Forms

Form 1: Page 1

Palo Verde School Palo Verde, Arizona

A Bridges SOI Model School

1. According to records of Intellectual Development Systems the student population of Palo Verde School is comprised of students as listed in the following table. If the information listed is not correct, *please indicate the correct percentages in the space on the right. Only make changes if a given value is not accurate.*

Currently Reported Percent of Students with Characteristic	Student Characteristic	Change Reported Value to the Value Below
10	African American	
45	Anglo	
45	Hispanic	
0	Other	
8	Special Education	
25	Limited English Prof. (LEP)	
65	Free or Reduced Lunch	

2. Do you have summary information on the level of education and income for families in the district? This information would help describe the context in which the Bridge SOI program is implemented.

3. To identify groups for which the Bridges may be more or less effective, will you be able to provide the following information on an individual student basis?

Student Characteristic	Type of Information Needed
Ethnicity	Identified Group
Gender	Identified Gender
Received an Integrated Practice Protocol	Yes or No

1. From the beginning to the end of the program last year, how would you summarize any changes in the degree of faculty buy-in to the program?

2. Based on your observations and judgment, was the program implemented according to the specifications given for it? Are there any strengths or weaknesses that you found particularly noteworthy in this regard?

3. Did student participation in the program match the specifications for their participation? Are there any strengths or weaknesses that you found particularly noteworthy in this regard?

4. Did corporate participation in the program match the specifications for its participation? Are there any strengths or weaknesses that you found particularly noteworthy in this regard?

Appendix B

Initial Test Differences on the Stanford 9 Reading and Mathematics Tests:

Comparing Bridges Lab Participants and Non Participants at Each Grade Level

Grade	Lab Partic.	Initial Stanford 9 Reading				Initial Stanford 9 Mathematics			
		Mean	SD	N	F	Mean	SD	N	F
3	No	573.92	45.68	12	1.63	562.42	35.86	12	0.38
	Yes	543.20	43.69	5		549.00	57.19	6	
4	No	577.00	21.50	6	0.00	573.50	23.61	6	0.57
	Yes	576.45	50.59	11		560.91	36.63	11	
5	No	617.00	18.68	6	5.11*	605.86	24.12	7	15.28**
	Yes	669.00	53.63	9		663.00	32.19	9	
6	No	653.50	67.18	2	0.24	631.67	30.09	3	0.14
	Yes	640.44	32.82	18		625.32	27.15	22	
7	No	645.63	35.12	8	3.61	647.63	18.84	8	5.57*
	Yes	679.64	40.73	11		689.00	46.62	11	
8	No	683.08	25.55	12	0.36	687.83	29.05	12	1.88
	Yes	693.50	48.44	6		714.83	55.80	6	

Note. SD signifies the standard deviation. F values with an * are significant with $p \leq .05$, those with ** at $p \leq .01$.

Appendix C

The Educational Status of Bridges Lab Participants

Bridges Lab Students Classified by Grade and Educational Status

Grade	Percent of Students by Educational Status			Total Number
	Special Education	Gifted	Other	
3	14	14	71	7
4	8	8	83	12
5	0	60	40	10
6	8	4	88	25
7	15	31	54	13
8	25	13	63	8

Appendix D

Stanford 9 Reading and Math Gain Scores:

Comparing Bridges Lab Participants and Non Participants by Grade

Grade	Lab Partic.	Stanford 9 Reading				Stanford 9 Mathematics			
		Gain	SD	N	F	Gain	SD	N	F
3	No	17.64	24.88	11	.49	18.82	25.00	11	.15
	Yes	27.50	21.92	4		13.80	22.43	5	
4	No	38.83	30.19	6	.21	28.83	18.31	6	4.47^
	Yes	33.09	20.99	11		45.36	13.72	11	
5	No	22.50	16.56	6	.68	20.43	10.66	7	7.23*
	Yes	12.22	27.19	9		5.22	11.63	9	
6	No	0	.	1	.02	21.00	25.46	2	.12
	Yes	15.13	18.55	16		25.85	18.76	20	
7	No	18.25	15.80	8	.02	26.88	31.90	8	.98
	Yes	19.46	19.99	11		15.36	18.85	11	
8	No	17.00	18.61	12	.76	9.00	10.20	12	1.04
	Yes	8.17	23.44	6		2.33	17.91	6	

Note. SD signifies standard deviation. An * indicates $p \leq .05$, an ^ indicates p approximately = .05.

Appendix E

Stanford 9 Reading and Math Real Gain Scores and Expected Gains:

Within Each Grade Comparing Gains by Bridges Lab Participants to Expected Gains,

and Comparing Gains by Bridges Lab Non Participants to Expected Gains

Grade	Lab Partic.	Stanford 9 Reading				Stanford 9 Mathematics			
		Gain	SD	N	t	Gain	SD	N	t
3	No	-17.36	24.89	11	-2.31*	-7.18	25.00	11	-.95
	Yes	-7.50	21.92	4	-.68	-12.20	22.43	5	-1.22
4	No	16.83	30.19	6	1.37	2.83	18.31	6	.38
	Yes	11.09	20.99	11	1.75	19.36	13.72	11	4.68**
5	No	6.50	16.56	6	.96	-.57	10.66	7	-.14
	Yes	-3.78	27.18	9	-.42	-15.78	11.63	9	-4.07**
6	No	-9.00	.	1		11.00	25.46	2	.61
	Yes	6.13	18.55	16	1.32	15.85	18.76	20	3.78**
7	No	.25	15.80	8	.04	12.88	31.90	8	1.14
	Yes	1.55	19.99	11	.26	1.36	18.85	11	.24
8	No	7.00	18.61	12	1.30	0.00	10.20	12	0.00
	Yes	-1.83	23.44	6	-.19	-6.67	17.91	6	-.91

Note. SD signifies standard deviation. An * indicates $p \leq .05$, a ** indicates $p \leq .01$. A blank cell has too few subjects to compute a t test.